10 YEARS of POLAND in ESA

Warsaw, 27-28 October 2022
Directorate of Navigation, ESA

Building Satellite Navigation in Europe

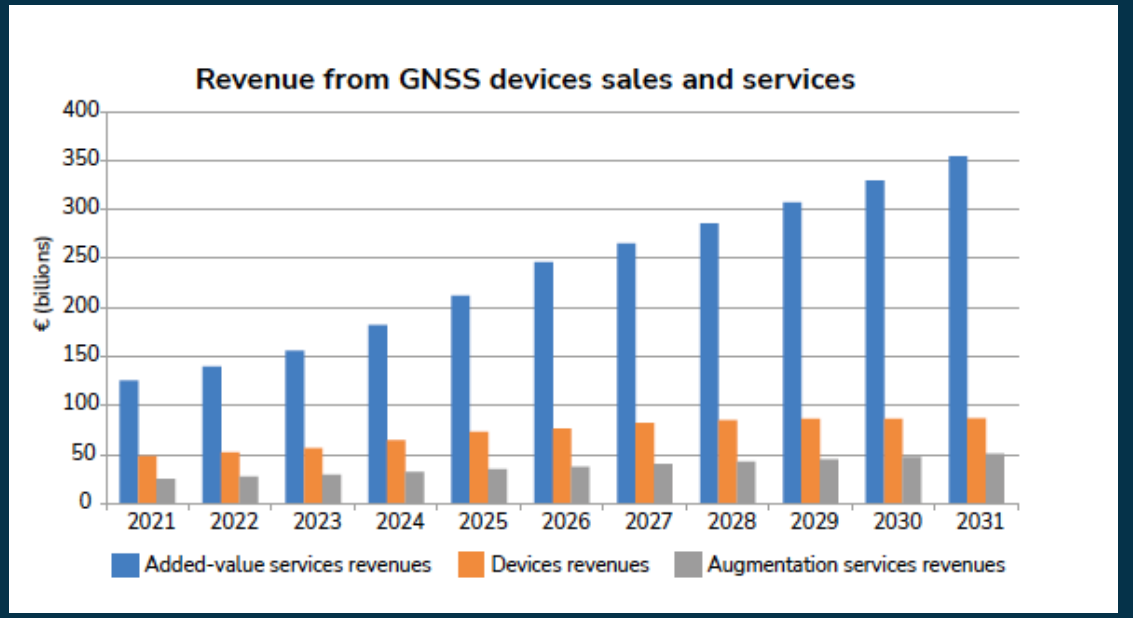
GALILEO

- Most accurate satnav system worldwide
- 3.5 billions users
- Finding your way and saving lives
- 2nd Generation on the way

EGNOS

- Ensuring safety-of-life for aviation, maritime, rail and road
- Regional coverage over EU, worldwide compatibility
- 1500 procedures in 360+ airports in Europe

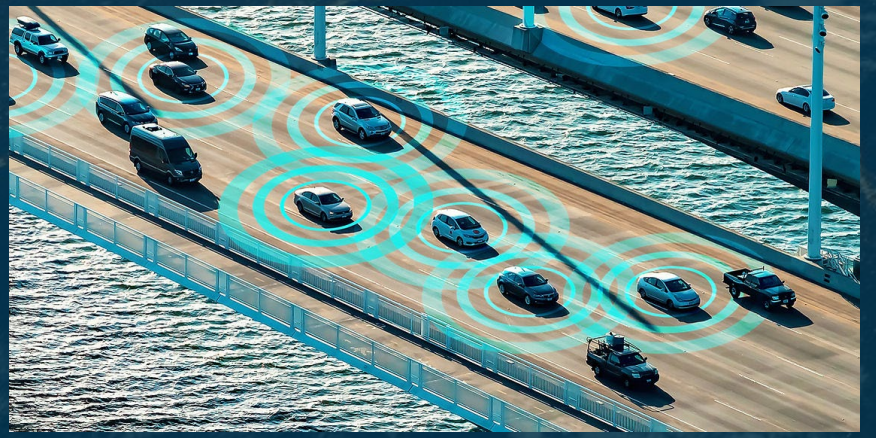
The success of GNSS and the rise of PNT



Global Mobility: future PNT market trends

GNSS huge success inspires more demanding needs for the next decade:

- Fast convergence, high accuracy, secure, resilient PNT
- Outdoor, autonomous vehicles, UAVs
- Indoor, Personal LBS and Industrial IOT (logistics, machine control)
- Low-energy IOT asset tracking
- Integration with Terrestrial 5G/6G for ubiquitous PNT
- Connected PNT (2-way data channels)



ESA/JRC Summerschool on GNSS 2022 in Kraków

Summerschool Mission

Knowledge
GNSS Systems
LAB WORK
PNT
INTERNATIONAL
RENOWNED
SCIENTISTS
RESEARCH

Organized by

- ESA and EC Joint Research Center

Local Support and supporting Academia

- Polish Space Agency
- University of Olsztyn

Cooperating Universities

- Stanford University, U.S.
- Institut Supérieur de l'Aeronautique et de l'Espace, France
- TU Graz, Austria
- University FAF Munich, Germany

Nationality	#Students	Based	#Students
Spain	8	Germany	21
Turkey	1	The Netherlands	2
Togo	1	Czech Republic	1
Switzerland	2	France	5
Surinam	1	Luxembourg	1
Poland	1	Denmark	2
The Netherlands	1	Finland	4
Italy	8	Switzerland	1
Iran	3	Italy	6
Germany	7	Belgium	8
France	3	Spain	2
Finland	3	**Total**	**53**
Denmark	2		
Czech Republic	1		
China	3		
Brazil	1		
Croatia	1		
Haiti	1		
Belgium	1		
Pakistan	2		
South Africa	2		
Total	**53**		

CMIN 22 - Navigation

Strengthening Europe's global leadership in Positioning, Navigation & Timing

NAVISP Phase 3

new system technologies, pre-operational activities, innovative services, and offer support to ESA Member States

Future NAV

LEO-PNT

GENESIS

Colocation of Geodetic Techniques in Space

moonlight

NAVISP continuation (Phase 3): the right tool to support expanding European PNT capabilities

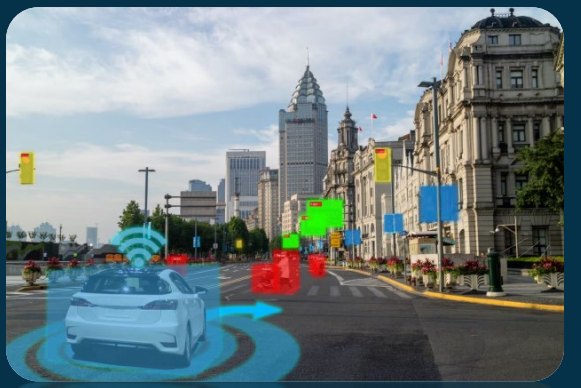
Element 1

Analyse and develop new PNT systems technologies

Element 2

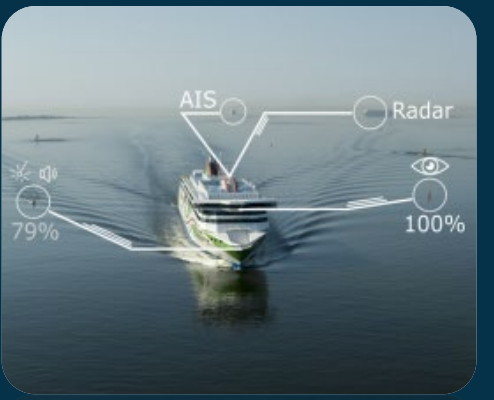
Ad hoc technological developments and pre-operational activities

Support the emergence of innovative PNT services



Element 3

Support to MS National Programmes along the whole value chain



NAVISP Phase 3	CM22
	120

NAVISP: Some Areas of Interest from past involvements of Polish Actors

GNSS SW Receivers for Microlaunchers and Microsatellites

Dual Galileo/GPS system for monitoring of vehicle and persons in difficult conditions

Geo-localisation services for medical emergency

Informational support for touristic destination selection and trip planning

Support for safe navigation in harsh water environment

POL subscription for NAVISP Phase 1: 2.1 M€ (funds used)
POL subscription for NAVISP Phase 2: 940 K€ (funds used)

NAVISP Phase 3 will have to enjoy a further increase of NAVISP Polish subscription in line with the upcoming opportunities and demand of the national PNT ecosystem

Future NAV: preparing the future of European GNSS

Program Objectives: secure strategic capabilities for independent European satellite navigation infrastructure and services, through support to the early development of advanced satellite navigation technology which has the potential to support operational and scientific missions, both private commercial as well as institutional programmes defined by the European Union

Future NAV comprises 2 components:

a) **The *LEO PNT Component***, which includes the definition, development, launch operations and experimentation of a LEO PNT In-Orbit Demonstration system

Activity	Directorate Lead Board	2023	2024	2025	2026+	CM22
LEO PNT	NAV / PB-NAV	20	30	30	20	100

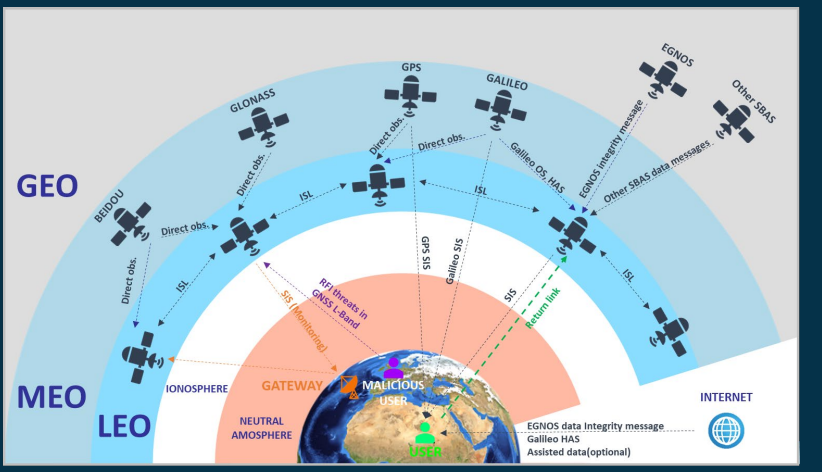
b) The ***GENESIS Component***, which includes the definition, development, launch and operations of the GENESIS Mission

Activity	Directorate Lead Board	2023	2024	2025	2026+	CM22
GENESIS	NAV / PB-NAV	10	15	30	25	80

The results of the Request for Interest (RFI) campaign for both components are very positive and will be taken into account in the ITT preparation.

LEO Positioning, Navigation & Timing

1. **Program Objectives**: Prepare the future of GNSS by anticipating PNT market trends and more demanding needs i.e.:
   - Fast convergence, high accuracy, secure, resilient PNT
   - Outdoor, autonomous vehicles, UAVs
   - Indoor, Personal LBS and Industrial IOT (logistics, machine control)
   - Low-energy IOT asset tracking
   - Integration with Terrestrial 5G/6G for ubiquitous PNT
   - Connected PNT (2-way data channels)
2. **Demonstration of LEO PNT**: Fast convergence PPP, additional data channel, two way communication for IOT, in-door positioning, robustness increase, frequency diversity (UHF, L, S, Ku, Ka band), optical ISL connectivity and on-board autonomy



GENESIS: Colocation of Geodetic Techniques in Space

1. **Program Objectives**: on-board collocation of four space GNSS/Geodetic techniques (GNSS Rx, VLBI, DORIS, SLR) to contribute to improve GNSS, Geodetic and Earth Science techniques, and supporting the “Space for a Green Future” Accelerator
2. **Scientific fields:**
    1. **Navigation** - Improvement on GNSS orbits and GNSS positioning
    2. **Geodesy** - Improvement of the International Terrestrial Reference Frame (ITRF)
    3. **Earth Sciences** - Improvements in sea level change measurements, ice mass losses, gravity field improvement,

FutureNAV RFI – Intense Industrial Consultation during Summer 2022

LEO-PNT – RFI overview

- **L** Large number of Notification of Interests (NoI) received
- **E** Lot of interest, information and feedbacks, confirming expectations
- **O** Multi purpose (Institutional / Commercial prospects)
- **-** Large interest and engagement of European industry across domains (PNT, New Space, Services)
- **P** Confirmation of attractiveness of all identified LEO PNT capabilities
- **N** Entities from large majority of Member States identified
- **T** Significant interest from SMEs and NewSpace companies

LEO-PNT – RFI Proposal Outcome

Areas of Interest provided by Polish Actors

Scope of Opportunities

Payload: on-board integrity monitoring unit

GMV Innovating Solutions candidate for LEO-PNT Payload

Satellite Platform

Creotech Instruments S.A. Hypersat satellite platform candidate for LEO-PNT mission

Poland
Contribution Level:
2 MEUR (Payload)
>5 MEUR (Platform)

GENESIS – RFI Overview

- **G** Interest received for **all aspects of the mission**
- **E** **Prime role covered**
- **N** **All Instruments covered - the 4 different geodetic techniques and on-board clock payload** (Incl. Scientific follow up/operations)
- **E** **Launchers** (New space)
- **S** **A good number of additional companies identified** as possible equipment providers in prime proposals
- **I** **Proposed Optional Instruments also** covered in the RFI
- **S** Possibility of **integration of NASA payload (remains feasible)**

GENESIS – RFI Proposal Outcome

Areas of Interest provided by Polish Actors

Scope of Opportunities

Equipment Supplier

Potential for supplying platform equipment / sub-system elements for the GENESIS satellite

- **Airbus Poland S.A.**
- **GMV Innovating Solutions**
- **Deimos**
- **Hertz Systems**
- **…**

Scientific Contribution

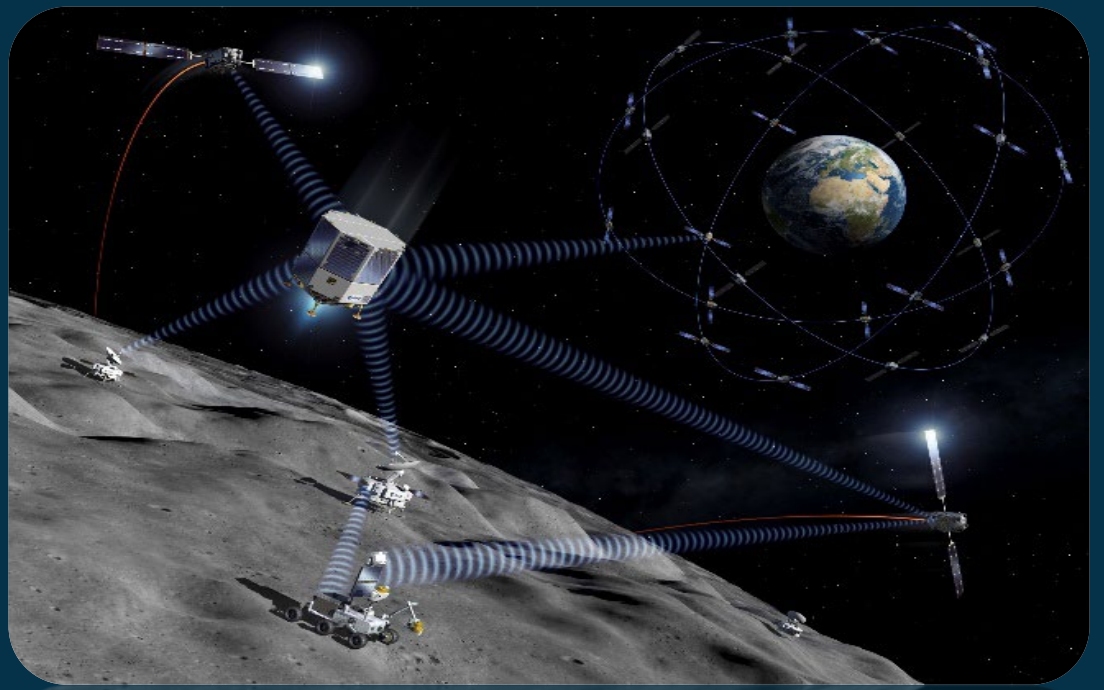
Potential for participation in scientific follow up and scientific ground segment preparation / data exploitation

- **Wroclaw University of Environmental and Life Sciences (Part of GENESIS White Paper)**
- **Un. of Warmia and Mazury, Dept. of Geodesy (ESA GSAC Member)**
- **Head Office of Geodesy and Cartography (GUGiK)**
- **AGH UST**
- **…**

Polish Contribution Level:
~1 MEUR (Industrial)
TBD (Scientific)

Moonlight

Lunar Communication and Navigation Services



Data transport	Absolute Position
Tele-operations	Absolute Velocity
Audio/Video streaming	Universal time
Alert & Information	Third-party payloads
Search and Rescue	Over-the-top Services

- A dedicated constellation of satellites around the Moon providing Communication and Navigation servcies
- ESA supporting infrastructure development (80%) and acting as Anchor customer
- Moonlight is a key constituent of the European lunar exploration strategy for next 20 years

European Satellite Navigation programmes offer a unique opportunity for industry to develop state-of-the-art operational space and ground infrastructure and down-stream PNT user equipment, applications and services

- ✓ ESA CMIN22: NAVISP, Future NAV, Moonlight
- ✓ EU-ESA FFPA: Galileo, EGNOS, Horizon Europe

Europe's ambition to maintain SATNAV World-wide competitiveness and leadership on the Earth … and Beyond